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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/945,397

08/30/2001

Gurtej Singh Sandhu

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11/18/2003

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EXAMINER

TRINH, MICHAEL MANH

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 11/18/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/945,397

Applicant(s)

SANDHU ET AL.

Examiner

Michael Trinh

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-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 August 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 10-35 and 109-129 is/are pending in the application.
- 4a) Of the above claim(s) 23-35 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 129 is/are allowed.
- 6) ☒ Claim(s) 10-12, 15-20, 22, 109-126 and 128 is/are rejected.
- 7) ☒ Claim(s) 13, 14, 21 and 127 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 11.

- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

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DETAILED ACTION

*** This office action is in response to Applicant's amendment filed on August 27, 2003.

Claims 1-9,36-108 were canceled. Claims 10-35, 109-124, and 125-129 are pending, in which claims 23-35 are non-elected invention, without traverse.

*** The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 112

1. Claims 109-124 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for forming a dielectric cap on a top of the sidewalls of the conductive container structure such as in claim 10 with the fill layer formed inside the conductive container structure with a level below a top of the insulating layer formed outside of the conductive container structure, it does not reasonably provide enablement of the method as claimed in independent claims 109, 113, 115, 117, 121, and 123 and in the absence of a fill layer formed inside the conductive container structure with the insulating layer formed outside of the conductive container structure, which are necessarily critical or essential to the practice of the invention before forming a dielectric cap on a top of the sidewalls of the conductive container structure, but not included in the claim(s) is not enabled by the disclosure. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). Accordingly, the specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims.

2. Claims 109-128 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

*** Applicant's remarks that "...the parent [independent] claims are not written in a manner that limits the claims to any particular order of the steps...". However, what are any different order of processing steps of each of these independent claims such as claims 109, 113, 115, 117, 121. For example, it is noted that claim 110 recites "...method of claim 109, wherein the processing proceeds in the order presented". However, the steps of claim 109 are performed in the order as recited, wherein forming a conductive container structure is performed

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before forming a dielectric cap on a top of the sidewalls of the conductive container structure. Accordingly, meaning and scope of the claims together with Applicant's remarks and maintain that "...the parent [independent] claims are not written in a manner that limits the claims to any particular order of the steps..." render meaning and scope of the claims being unclear and indefinite. Indeed, it is the fact that Applicant even fails to particularly point out any different order of steps of these claims.

*** Similarly, re claim 126: claim 126 further recites "...occurs subsequent..."; however, base claim 125 already recites "...the following processing steps in the order presented...". Accordingly, meaning and scope of the claim 126 with Applicant's remarks are unclear and indefinite.

*** Re claim 128, the phrase "claim 125, wherein removing the dielectric layer from the insulating layer and the fill layer..." lacks proper antecedent basis. It appears that claim 128 should be dependent of claim 127, not claim 125.

Claim Rejections - 35 USC § 102

3. Claims 109,110,113,114,117,118,121, and 122 are rejected under 35 U.S.C. 102(b) as being anticipated by Dennison (5,206,183).

Dennison '183 teaches a method for forming a semiconductor container capacitor structure having a dielectric layer comprising at least the sequential steps of: forming a conductive container structure 28 having a closed bottom and sidewalls extending upward from the closed bottom (Figs 3,6,20; cols 4-5; col 6, line 59 through col 7); forming a dielectric cap 75 (Figs 20-21, col 7, lines 29-60) on a top of the sidewalls of the conductive container structure 28 having the dielectric cap 75, wherein the dielectric cap 75 remained on the top of the sidewalls is used as part of the dielectric layer for electrically insulating (Fig 21; col 6, lines 52-58; col 12, claim 28, lines 42-45); forming a dielectric layer 42,38 thereafter on the capacitor structure, and thus, including the dielectric cap 75 used as an electrical insulator about portions of the storage node projecting into the bit line contact openings; and forming a cell plate 44 on the dielectric layer 42,38 wherein the conductive container structure 28 comprises polysilicon, wherein the dielectric cap 75 comprises oxide.

Claim Rejections - 35 USC § 103

4. Claims 111-116, 119-120, 123-124 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dennison (5,206,183) as applied above, and further of Lur et al (5,364,817) and Abernathey et al (4,725,560).

Dennison '183 teaches a method for forming a semiconductor device of a container capacitor as applied to claims 109, 110, 113, 114, 117, 118, 121, and 122 above.

Dennison '183 already teaches material of the dielectric cap comprising silicon oxide; whereas, claims 111 and 119 recites silicon oxynitride while claims 113, 115, 121, and 124 recite selecting dielectric cap material from a group consisting of oxides, nitrides, and silicon oxynitrides. Dennison lacks annealing the dielectric cap in claims 112, 115, 120, and 123.

However, Lur et al teaches (at col 3, lines 38-56) forming a dielectric cap 28 on the sidewalls of a conductive container structure 24, wherein the dielectric cap comprises a dielectric material selected from a group consisting of oxides, nitrides, and silicon oxynitrides. Abernathey et al teach forming silicon oxynitride as a storage dielectric cap material instead of silicon oxide, and annealing the dielectric cap material of silicon oxynitride (col 5, lines 44-68; col 3, lines 16-53; cols 6-7).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the dielectric cap of Dennison by alternatively using a dielectric material selected from a group consisting of oxides, nitrides, and silicon oxynitrides as further taught by Lur et al and Abernathey, because the substitution of art recognized equivalent dielectric materials would have been obvious and within the level of one having ordinary skill in the semiconductor art, wherein annealing the dielectric cap of silicon oxynitride as taught by Abernathey would have been obvious to one of ordinary skill in the art because of the desirability to form a high quality silicon oxynitride dielectric cap layer having a high breakdown voltage for storage capacitor, wherein processing steps are obviously carried out in the order as to form the conductive container structure. Additionally, it would also have been obvious to one of ordinary skill in the art at the time the invention was made to form the capacitor electrode of Dennison by employing other well known alternative silicon materials selected from a group consisting of amorphous silicon, polysilicon, and hemispherical grain polysilicon, because the

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substitution of art recognized equivalent silicon materials for forming the capacitor electrodes would have been obvious and within the level of one having ordinary skill in the art.

5. Claims 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dennison (5,206,183) taken with Dennison (5,888,877) or Ahn (5,284,787).

Dennison '183 teaches a method for forming a semiconductor device of a container capacitor comprising at least the subsequent steps of: forming an insulating layer 22 on a substrate (Fig 1); forming an opening in the insulating layer 22; forming a conductive layer 28 on the insulating and exposed portion of the substrate (Fig 2); filling the opening with a fill layer 30 on the conductive layer; removing the conductive layer and the fill layer thereby forming a conductive container structure 28 having a closed bottom and sidewalls extending upward from the closed bottom (Figs 3,6,20; cols 4-5; col 6, line 59 through col 7); forming a dielectric cap 75 (Figs 20-21, col 7, lines 29-60) on a top of the sidewalls of the conductive container structure 28; removing the fill layer 30 to expose inside of the container structure (Fig 6); removing at least a portion of the insulating layer 22 to expose outside of the structure (fig 6); forming the capacitor by forming a dielectric layer 42 on the conductive container structure 28 having the dielectric cap 75; and forming a cell plate 44 on the dielectric layer 42, wherein the conductive container structure 28 comprises polysilicon, wherein the dielectric cap 75 comprises oxide.

Dennison '183 lacks removing the conductive and fill layers to a level below a top of the insulating layer thereby forming the container structure.

However, Dennison '877 teaches removing the conductive layer and fill layer to a level below a top of the insulating layer thereby forming a conductive container structure (Figs 6-8; col 6). Ahn '787 teaches removing the conductive layer 200 and fill layer 52 to a level below a top of the insulating layer 32 (Fig 3C) thereby forming a conductive container structure (Figs 3C-3E; col 6, lines 49 through col 7; cols 5-6).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the method of Dennison '183 removing the conductive layer and fill layer to a level below a top of the insulating layer thereby forming a conductive container structure as taught by Dennison '877 or Ahn '787. This is because of the desirability

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to electrically isolate the rim of the conductive layer, wherein processing steps are obviously carried out in the order as to form the conductive container structure.

6. Claims 15-20,22,125 and 126 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dennison (5,206,183) taken with Dennison (5,888,877) or Ahn (5,284,787), as applied above to claims 10-12, and further of Lur et al (5,364,817) and Abernathey et al (4,725,560).

Dennison '183 and Dennison '877 or Ahn teach a method for forming a semiconductor device of a container capacitor as applied to claims 10-12 above.

Dennison '183 already teaches material of the dielectric cap comprising silicon oxide; whereas, claim 18 recites silicon oxynitride and while claim 20 recites selecting dielectric cap material from a group consisting of oxides, nitrides, and silicon oxynitrides. Dennison lacks annealing the dielectric cap in claims 19 and 22.

However, Lur et al teaches (at col 3, lines 38-56) forming a dielectric cap 28 on the sidewalls of a conductive container structure 24, wherein the dielectric cap comprises a dielectric material selected from a group consisting of oxides, nitrides, and silicon oxynitrides. Abernathey et al teach forming silicon oxynitride as a storage dielectric cap material instead of silicon oxide, and annealing the dielectric cap material of silicon oxynitride (col 5, lines 44-68; col 3, lines 16-53; cols 6-7).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the dielectric cap of Dennison '183 by alternatively using a dielectric material selected from a group consisting of oxides, nitrides, and silicon oxynitrides as further taught by Lur et al and Abernathey, because the substitution of art recognized equivalent dielectric materials would have been obvious and within the level of one having ordinary skill in the semiconductor art, wherein annealing the dielectric cap of silicon oxynitride as taught by Abernathey would have been obvious to one of ordinary skill in the art because of the desirability to form a high quality silicon oxynitride dielectric cap layer having a high breakdown voltage for storage capacitor. It would also have been obvious to one of ordinary skill in the art at the time the invention was made to form the device of Dennison '183 by employing other well known alternative silicon materials selected from a group consisting of amorphous silicon, polysilicon, and hemispherical grain polysilicon for the conductive container structure, by

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employing other well known alternative insulating materials selected from a group consisting of oxides, nitrides and borophosphosilicate glass for the insulating layer, by employing other well known alternative fill materials selected from a group consisting of photoresist and high etch rate oxides for the fill layer. This is because the substitution of art recognized equivalent materials would have been obvious and within the level of one having ordinary skill in the art.

Allowable Subject Matter

7. Claim 129 is allowed.

8. Claims 13-14, 21, 127 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. The following is a statement of reasons for the indication of allowable subject matter:

The references of record, alone or in combination, do not anticipatively disclose each and every aspect of the claimed method, or fairly make a prima facie obvious case of the claimed method, in combination with other processing claimed limitations, the inclusion in all of the claims of forming a dielectric cap on a top of the sidewalls of the conductive layer by forming a dielectric layer on the insulating layer, the conductive layer and the fill layer, and removing the dielectric layer from the insulating and the fill layer.

Response to Arguments

10. Applicant submitted a statement in the remarks filed on August 27, 2003 (page 17) that "...present application and U.S. Patent No. 6,150,691 issued to Clamplit were, at the time the invention of the present application was made, owned by Micron Technology, Inc..."

Accordingly, the U.S. Patents 6,150,691 is disqualified as prior art through 35 U.S.C. 102(e), (f) or (g) in any rejection under 35 U.S.C. 103(a) in this application.

11. Applicant submitted a statement in the remarks filed on August 27, 2003 (page 17) that "...present application and U.S. Patent No. 6,255,687 issued to Figura were, at the time the invention of the present application was made, owned by Micron Technology, Inc..."

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Accordingly, the U.S. Patents 6,255,687 are disqualified as prior art through 35 U.S.C. 102(e), (f) or (g) in any rejection under 35 U.S.C. 103(a) in this application.

The U.S. Patent No. 6,255,687 is a division of the U.S. Patent No. 5,963,804 also issued to Figura. Accordingly, the U.S. Patent No. 5,963,804 is also disqualified as prior art through 35 U.S.C. 102(e), (f) or (g) in any rejection under 35 U.S.C. 103(a) in this application, as owned by Micron Technology, Inc. at the time the invention of the present application was made.

12. Regarding 112 rejection, first paragraph: Applicant's remarked (at remark page 14) that claim 109 is enabled by the specification, as shown at Figures 1-8 and Figures 10-12, and "the fill layer 15 need not be below the top of the insulating layer 50".

In response, it is noted and found unconvincing, since these claims including claim 109 fail to recite the fill layer 15, which layer is necessarily critical or essential to the practice of the invention before forming a dielectric cap on a top of the sidewalls of the conductive container structure. In the absence of a fill layer formed inside the conductive container structure with the insulating layer formed outside of the conductive container structure, it is not enabled by the disclosure. Accordingly, the specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims.

13. Regarding 112 rejection, second paragraph: It is not disagreed with Applicant the "comprising" term does not exclude additional, unrecited elements or method steps...". It is also noted that dependent claims place temporal limits on when subsequent steps, as listed in the claims, can be performed.

However, in this case, the steps of independent claim are already performed in the order as recited. For example, in claim 109, forming a conductive container structure is performed before forming a dielectric cap on a top of the sidewalls of the conductive container structure. If there is any different order than the recited order, then what is it?. Accordingly, Applicant's remarks and maintain that "...the parent [independent] claims are not written in a manner that limits the claims to any particular order of the steps..." render meaning and scope of the claims

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being unclear and indefinite. Indeed, it is the fact that Applicant even fails to particularly point out and show any different order of steps of these claims.

*** Applicant's other remarks about prior art rejections of the claims have been considered but they are moot in view of the new ground(s) of rejection.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

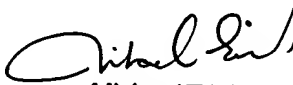
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael M. Trinh whose telephone number is (703) 308-2554. The examiner can normally be reached on M-F from 8:30 Am to 4:30 Pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (703) 308-4905. The central fax phone number is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Oacs-7


Michael Trinh
Primary Examiner